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NPIC/TDS/D-811-67
18 April 1967

MEMORANDUM FOR: Chief, Imagery Analysis Staff, DDI

ATTENTION : Chief, Operations Staff

SUBJECT : [redacted] Rapid Interpretation Printer-Processors (RIPP) 25X1

REFERENCE : Memorandum, IAS/OSS-27-67 dated 21 February 1967
Memorandum, NPIC/TDS, Memorandum for the Record, 17 April 1967

1. [redacted] of our staff, the contract monitor for the [redacted] Rapid Interpretation Printer-Processors has recently completed an evaluation of the six RIPPs delivered to IAS. A copy of this evaluation is attached. 25X1 25X1

2. The evaluation concludes that the six RIPPs have operated satisfactorily over a considerable length of time and therefore should be accepted by the Government with an effective acceptance date of 3 April 1967. The contractor is to furnish 90 days of free maintenance commencing on that date.

3. You requested that final acceptance be delayed until IAS approved the performance of the RIPPs. [redacted] has not yet been notified of the acceptance of the units. Please notify us of your decision regarding the approval of the subject equipment. 25X1

[redacted] 25X1
Colonel, USAF
Assistant for Technical Development, NPIC

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GROUP 1
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NPIC/TDS/D-804-67
13 April 1967

MEMORANDUM FOR THE RECORD

SUBJECT: Test and Evaluation of [redacted] RIPPs, Serial Numbers 1001 through 1006, Project 997116 25X1

1. Under contract [redacted] delivered five Rapid Interpretation Printer Processors, [redacted] Model RIPP-101 and modified a sixth RIPP that had been delivered under a previous contract [Contract [redacted]]. The sixth RIPP consisted of about 90% new components and for all practical purposes was a new unit. This memorandum is an evaluation of the six Rapid Interpretation Printer Processors. 25X1 25X1 25X1

2. The RIPP delivered under previous contract [redacted] had excessive maintenance problems (eleven service calls in three months) and produced ammonia fumes to such a level that, although not hazardous at that level, were annoying to some operators. Under the new contract, TDS wrote new specifications for the RIPP. These specifications were rather stringent and called for an acceptance test where the six units were to operate for an average of 400 hours before needing maintenance. Confronted with these new specifications, the contractor completely re-designed the processor portion of the RIPP and made extensive modifications to the other components. 25X1

3. Following are references to the Specifications For Rapid Interpretation Printer Processor (copy attached) and comments as to the performance of the contractor in relation to these referenced specifications. Under the original contract, Paragraph 4.2 and 7.2 were deleted in their entirety.

3.1. Under section 2, Items Required, the contractor delivered all of the items required by the government with the exception of the desiccant. This item (also referred to under Paragraphs 4.1.4 and 5.7 of the specifications) was deleted by mutual agreement of [redacted] and the government and is covered under [redacted] letter to [redacted] dated 10 November 1966. The delivery date for each RIPP is listed on Attachment I. 25X1 25X1

3.2. Under section 4, Printer Processor Modifications, the contractor successfully incorporated all of the necessary modifications with the exception of item 4.1.4 as explained above in 3.1.

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3.3.1 Under section 5, Test of Five Rapid Interpretation Printer-Processors, an acceptance test was performed by TDS. This test required that each unit operate for a minimum of 200 hours before needing maintenance and that all units operate for an average of 400 hours before needing maintenance. This requirement is in most respects, more strigent than the requirement of a new automobile to perform under its guarantee. If an automobile were driven at 60 miles per hour, it would accumulate 24,000 miles in 400 hours. It is doubtful whether an automobile could perform under those conditions without requiring maintenance (oil change, lubrication, etc.) and, without a failure of any component. After acceptance of each unit by the Government, the Contractor is to provide a 90 day period of free maintenance and an additional nine month period of Government reimbursed maintenance.

3.3.2. It would have been wasteful to run these units for 400 hours each on a strictly test basis. Since IAS had an immediate need for the RIPPs, it was mutually agreed by TDS and IAS that these units be used operationally by IAS by their personnel. Meanwhile, TDS would keep track of the operation of the RIPPs and perform other tests to measure their performance. Since each RIPP had an elapsed time meter and an exposure counter, these data were easily recorded. IAS agreed to keep all units running approximately 40 hours a week so that the acceptance test could be completed expeditiously.

3.3.3. Referring to attachment 1, it can be seen that as of 24 March five of the units had run for 200 hours and were approaching the 400 hour level. However, based on a 40 hour week, the units have not been running anywhere near full time. An examination of Columns 5 and 6 show that the units have not been running 40 hours a week and have been used fewer hours per week as time progresses. I feel that the RIPPs have performed satisfactorily over an adequate length of time to justify their acceptance by the government. Therefore, IAS's conservative use of the RIPPs is well justified since it is wasteful to run any units that are not being used operationally and thus shorten their useful life.

3.3.4. It can be seen from Attachment 1 that three of the six units had one or more adjustments.

3.3.4.1. Column 9 - A plastic water line coupling split and was replaced on RIPPs 1002 and 1005. Each coupling was replaced in approximately ten minutes.

3.3.4.2. Column 10 - While closing the lid of the exposure section of RIPP 1005, the Vycor glass lid broke. It is possible that an operator accidentally or intentionally increased the pressure of the lid by adjusting the latch. The Contractor replaced the glass without cost to the Government. (Approximate cost $100) Latches on the lids of all

six units have been pinned to prevent further adjustment. Time needed to replace the glass was approximately one hour.

3.3.4.3. Column 11 - The latch on the lid of the exposure section of RIPP 1003 was broken. This latch was replaced by a new one sent from the Contractor. Time needed to replace the latch was about five minutes.

3.3.4.4. Column 12 - RIPP 1003 had a mechanical failure of the gears in the gear-motor that drives the processor. The entire gear motor was replaced by the Contractor. Time needed for this replacement was about two hours.

3.3.4.5. Columns 13, 14 and 15 - RIPP 1003 jammed on several occasions. As explained in the footnotes, these jams were probably caused by the insertion of bent or undersize sheets of film. The processor belts were worn by the last jam and the Contractor had to perform about six hours of maintenance to replace them.

3.3.5. Under paragraph 5.5, it is seen that each unit was to operate under certain physical conditions with an ammonia concentration not exceeding 100 parts per million (the tolerance level specified by industrial standards). Since local ammonia suppliers could not furnish the volume of the ammonia bottle the following calculations were made:

The ammonia bottle has a total volume of:

$$\frac{4.156 \text{ in.}^2}{2} \pi \times 15.562 \text{ in} = 211 \text{ in}^3$$

where 4.156 = outside diameter
15.562 = length

The bottle weighs 10 pounds and thus its wall must occupy:

$$\frac{10 \text{ lb}}{.284 \text{ lb/in}^3} = 35.2 \text{ in}^3$$

where .284 = density of steel in lb/in^3

$211 \text{ in}^3 - 35.2 \text{ in}^3 = 175.8 \text{ in}^3$ = inside volume of bottle

The ammonia pressure is 120 psig. Therefore, the volume of ammonia in the bottle at atmospheric pressure is:

$$\frac{120 \text{ psi}}{14.7 \text{ psi}} + 175.8 \text{ in}^3 = 1435 \text{ in}^3 = 0.83 \text{ ft}^3$$

IAS reported that the ammonia will last for at least 240 hours of RIPP operation. During this period of time, a room of 2000 ft^3 in which the air is replaced every 20 minutes would have had replaced the following volume of air:

$$240 \text{ hours} \times \frac{2000 \text{ ft}^3}{20 \text{ minutes}} \times \frac{60 \text{ minutes}}{\text{hour}} = 1{,}440{,}000 \text{ ft}^3$$

Therefore, the average concentration of ammonia in the room under such conditions can be approximated as:

$$\frac{0.83 \text{ ft}^3}{1{,}440{,}000 \text{ ft}^3} \approx 0.6 \text{ part per million}$$

The concentration near the RIPP would of course be higher. However, most ammonia bottles last more than 240 hours. One bottle lasted 445 hours. I have worked in a well ventilated room containing three RIPPs running simultaneously and felt no discomfort whatsoever. The RIPP delivered under previous contact was often criticised for its ammonia odor. While several people have mentioned the detection of the smell of ammonia on the new RIPPs, my personal interviews usually produced comments such as "It was much worse last week." The Contractor has attached a wrench near the valve of each ammonia bottle. In case of an emergency the wrench is immediately available to turn off the valve.

3.3.6. Paragraph 5.8. of the Specifications requires a resolution of 200 lines per millimeter. The Specifications do not stipulate whether the resolution must be measured at one point, at a certain percentage of points, or at all points on the copy.

The resolution is primarily dependent on the film emulsion (thickness, uniformity, chemistry), ability to obtain close contact between original and copy, light source, and exposure time. For the test of the RIPPs, the film emulsion was not measured but was assumed to be of a reasonably uniform quality. The light source was constant. The exposure time was varied to produce good resolution (about 40 seconds). More experimentation may have produced a more optimum resolution. The lids on the exposure sections were adjusted to produce a fairly uniform pressure between the original and copy material. The Contractor replaced the flat rubber pressure platen originally supplied with a shaped platen designed to apply pressure first to the center of the film and then progressively to the right and left sides of the film. This action assists in rolling out any air that might otherwise be trapped between the two sheets of film.

The target used to measure resolution was a 9 by 9 inch Type I Air Force 1951 high resolution target sheet made by Eastman Kodak Co. This sheet contained 21 targets equally spaced on an "X" pattern as shown on Attachment 2. It is important in a test of this nature to use a target that is approximately the same size as the copy material. If it is substantially smaller, the pressure applied by the platen will be locally increased over the small test target since the target protrudes several thousandths of an inch above the surrounding area. Also, it is much easier to iron out any air gaps between a small target and a copy film than between two larger sheets of film. Two of the targets on the test sheet were examined and found to be of poor quality and were not used in the data. Attachment 3 shows a tabulation of the resolution for each RIPP. On 15 March, after adjusting the pressure platens, a copy was made on each RIPP and all targets measured. No reading above 317 lines per mm were recorded although on previous and subsequent tests points with a resolution of as high as 389 lines per mm were observed. Tests made on 25 January 1967 on RIPP 1006 by [redacted] and tests made on 8 March 1966 by [redacted] on the RIPP delivered under the first contract gave results comparable to those expressed on Attachment 3. 25X1 25X1 The graph on Attachment 4 shows the distribution of resolution readings for all six RIPPs. The ordinate of the graph shows the percentage of targets read at resolutions from 80 to 317 lines per mm. The total of these twelve points is 100 per cent. An essentially bell shaped curve has been approximated to show the distribution of these points. The curve extends out to near 400 lines per mm on the basis that on other occasions several targets were read at 389 lines per mm. Perhaps the right hand portion of the curve should be asymptotic since diazo materials have the capability of higher resolution. Some sources suggest that diazo materials may be able to reach 1000 to 2000 lines per mm. The graph shows that the average resolution for all six RIPPs is 230 lines per mm, while the red shaded area shows the spread of the resolutions of each unit. The limits of this area are also shown on Attachment 3. If one expects 200 lines per mm at a particular point on a target, then the cross-hatched area predicts the probability of obtaining this figure. An actual measurement of the cross-hatched area shows that it comprises 84.5 per cent of the total area under the curve. By counting the number of targets resolved at 317 lines, 278 lines, etc., the following was tabulated:

Resolution	Number		Resolution	Number
317	10		160	6
278	11		139	2
250	34		125	1
221	24	97 Subtotal	111	none
198	18		100	1
177	6		80	1
				TOTAL 114

The probability of obtaining 198 lines per mm or better is thus:

$$\frac{97}{114} = 85.1\%$$

Both of these figures therefore show that 200 lines per mm can be expected at about 85% of all points viewed. By a similar calculation, it can be shown that a resolution of 160 lines per mm or better can be obtained about 96% of the time.

It must be realized that an occasional piece of dust or other foreign matter may intervene between the original and copy sheet and thus produce a poor quality of image at that particular point. Thus, some of the lower resolutions observed in this report are very likely resultant from such circumstances. The dust problem is of concern in most types of copying systems.

The Technifax D8-201 diazo copy material has been measured to produce as high as 1.89 density and as low as 0.05 (on same test strip) as measured on the MacBeth Densitometer, model TD-102. The use of a green filter in the Densitormeter will produce density readings of nearly 2.10.

3.3.7. Section 6 required additional maintenance by the contractor after the Government's acceptance of the units. To date, [redacted] has been very cooperative in servicing the RIPPs. Except during periods of heavy snowfall, [redacted] usually answered our requests for service within 24 hours. This was accomplished even though IAS's need for all RIPPs to be operable was diminished after receipt of the fifth unit. (Two of the six units are used as spares). I see no reason to believe that [redacted] will not continue to be as cooperative in furnishing future maintenance. 25X1 25X1 25X1 25X1

3.3.8. All units were delivered to the Government within the required time except for 1006. It was kept by the contractor for ten days beyond the originally scheduled delivery date. This delay was agreed to by IAS and TDS.

4. The new specifications for the RIPP have accomplished their purpose - to develop a RIPP superior in operation and with less maintenance than its prototype predecessor. In addition it served to provide an excellent maintenance guarantee to the Government's benefit. The new unit has reduced ammonia odors and has operated with considerably less maintenance.

5. I believe that all six RIPPs have operated sufficiently well and long enough to be accepted by the Government. The only serious mechanical failure has been the wear of the gear-motor on RIPP 1003. Only one unit has jammed copies and there is strong evidence to indicate the jam was caused by operator mis-use. All units have demonstrated an ability to produce an average of about 230 lines per mm with nearly half of the points at 250 lines per mm or greater. If the units were operated 40 hours a week each one could have operated at least 400 hours by 3 April 1967. By that date the average running time for all six RIPPs would have been 525 hours. The contractor has thus far been most co-operative in fulfilling his contract. It behooves the Government to fulfill its obligations in an expeditious fashion. I recommend that the six units be accepted with an effective acceptance date of 3 April 1967. This will result in RIPP 1001 being under guarantee for 212 days while RIPP 1006 will have been guaranteed for 163 days.

25X1

Support Systems Branch, DS/TDS

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ATTACHMENT I

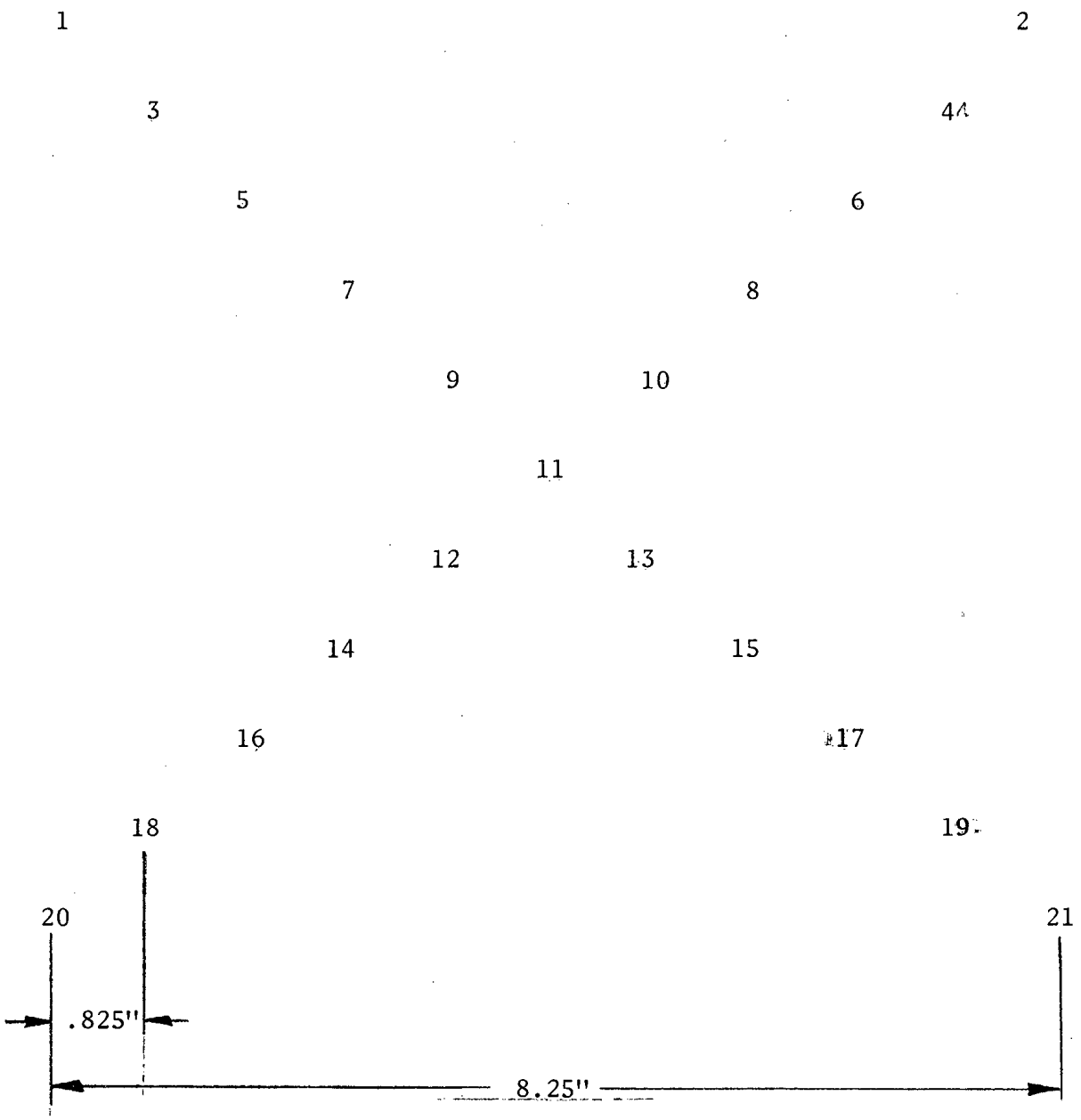
	RIPP SERIAL NUMBER					
	1001	1002	1003	1004	1005	1006
1. Date Delivered	12/2/66	12/15/66	12/15/66	1/6/67	1/6/67	1/20/67
2. Hours run as of 27 Feb	328	295	279	223	168	246
3. Hours run as of 24 March	381	307	305	280	177	401
4. Δ hours 27 Feb thru 24 Mar	53	12	26	57	9	155
% utilization as of 24 Mar	61.9	56.5	56.1	64.9	41.0	114.0
6. % utilization from 27 Feb thru 24 Mar	32.7	7.4	16.1	35.2	5.5	95.7
7. No. of exposures as of 24 Mar	648	276	520	200	255	499
8. Average resolution lines/mm	235	244	216	220	232	234
Adjustments after n hours						
9. Leak in water connection		88			80	
10. Broken glass platten					150	
11. Broken latch			120			
12. Worn gears			250			
13. Jammed copies			*200			
14. Jammed copies			281			
15. Jammed copies			**304			

* About ten jammed copies removed. One copy had bent corner.

** Nine jammed copies removed including two 70mm wide pieces. Instructions in manual and on Processor call for use of 9 1/2 X 9 1/2 sheets only. These 70mm sheets may also have caused jamming at 281 hours

ATTACHMENT 2

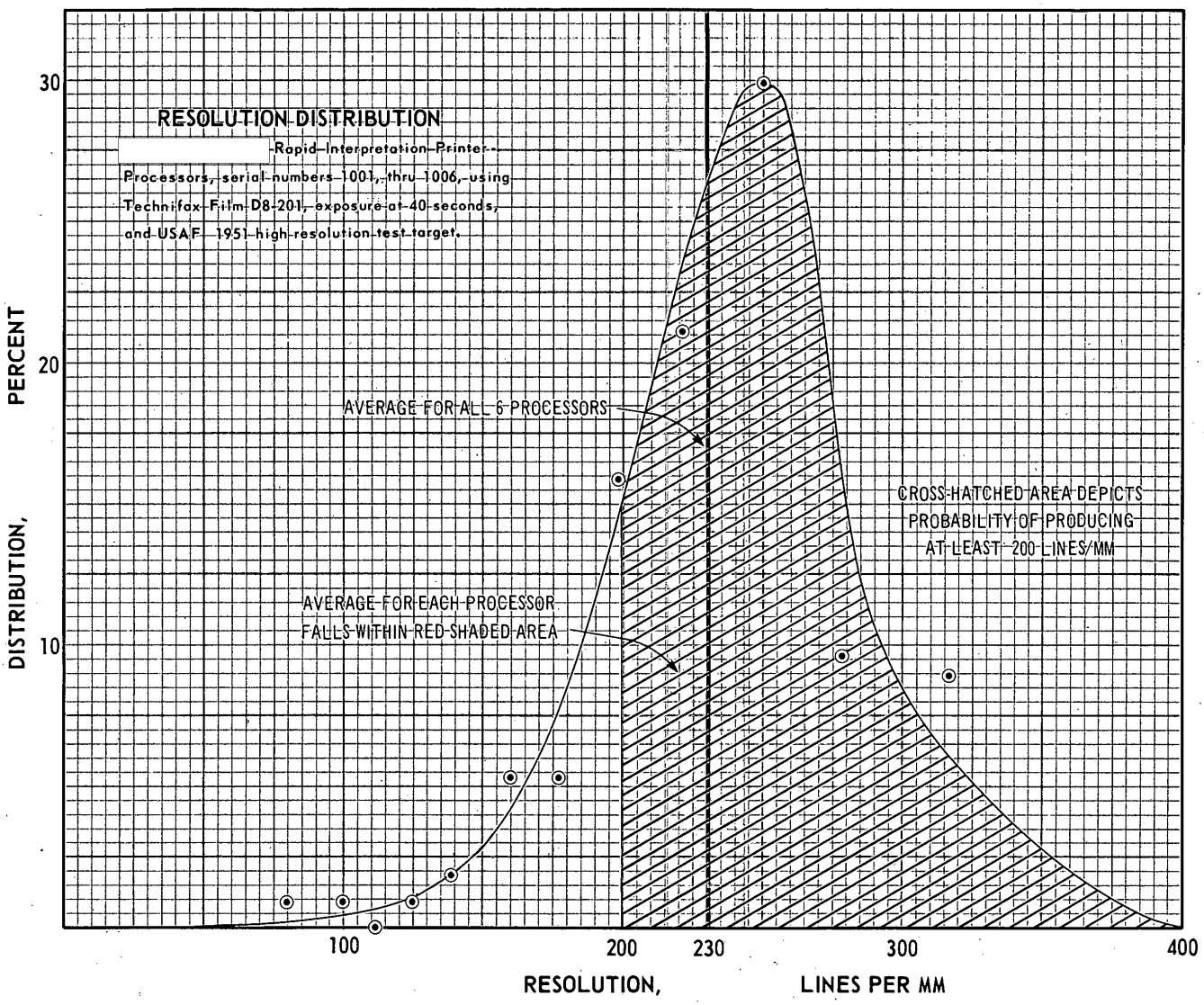
LOCATION OF TARGETS ON 9 X 9 INCH SHEET



NOT TO SCALE

ATTACHMENT 3

TARGET NO.	RIPP SERIAL NO.					
	1001	1002	1003	1004	1005	1006
	RESOLUTION READINGS-LINES PER MILLIMETER					
1	221	278	250	317	317	317
2	221	221	198	198	250	125
3	278	278	317	221	250	250
4	250	317	278	221	250	221
5	278	250	250	250	221	250
6	317	317	278	278	278	317
7	177	250	177	80	221	100
8	250	250	198	160	198	198
9	221	198	198	221	198	221
10	250	250	177	221	221	250
11	250	221	139	250	221	250
12	250	278	221	198	250	278
13	----------NOT USED----------					
14	221	221	160	198	139	250
15	221	221	160	221	198	250
16	278	250	250	317	250	250
17	160	250	250	198	317	250
18	198	221	250	177	317	221
19	177	198	178	198	221	198
20	250	160	160	250	198	250
21	----------NOT USED----------					
AVERAGE	235	244	215	220	231	234



25X1

ATTACHMENT 4